IOWA HIGHWAY RESEARCH BOARD (IHRB)
Minutes of March 27, 2015

Regular Board Members Present

A. Abu-Hawash
K. Jones
M. Kennerly
S. Okerlund
W. Weiss
R. Stutt
P. Mouw
K. Mayberry
L. Roehl
R. Fangmann
T. Wipf

Alternate Board Members Present

D. Sprengeler

Members with No Representation

R. Knoche
D. Schnoebelen
D. Miller

Secretary – V. Goetz

Visitors

Peter Taylor	CP Tech Center
Dale Harrington	CP Tech Center
Kejin Wang	Iowa State University
Travis Hosteng	Iowa State University
Jeramy Ashlock	Iowa State University
Scott Schram	Iowa Department of Transportation
Lisa McDaniel	FHWA

The meeting was held at the Iowa Department of Transportation Ames Complex, Materials East/West Conference Room, on Friday, March 27, 2015. The meeting was called to order at 9:00 a.m. by Chairperson Terry Wipf with an initial number of 11 voting members/alternates at the table.

1. Agenda review/modification

Dr. Lee is sick so Chris Williams will be presenting the Final Report TR-658 in his place and will present as soon as we complete the approval of the minutes.

2. Motion to approve Minutes from the February 27, 2015 meeting

Motion to Approve by R. Fangmann; 2nd K. Mayberry
Motion carried with 11 Aye, 0 Nay, 0 Abstaining.

3. FY 15 Second Round RFP: RFP's will be sent out mid-April.

- IHRB-14-08, Concrete Overlay Performance on the Local System: The RFP was modified to include all roads in Iowa.
- IHRB-14-10, Prevention of Longitudinal Cracking in Iowa Widened Concrete Pavement: No changes.
- IHRB-14-11, Prevention and Restoration of Early Joint Deterioration: No changes.

*****1 member joined the table. Total voting members = 12**

4. **PROPOSAL PHASE II for TR-663, *"Investigation into Shrinkage of Hiigh Performance Concrete Used for Iowa Bridge Decks and Overlays – Phase II Shrinkage Control and Field Invest Investigation,",*** Kejin Wang, Iowa State University/InTrans, ($299,993)

BACKGROUND

In the Phase I study of Project TR-633, shrinkage behavior and cracking potential of 11 typical HPC mixes used in Iowa bridge decks and overlays were studied. Cracking potential of the concrete mixes was assessed based on both ASTM C 1581 and simple stress-to-strength ratio methods.

OBJECTIVES

The long term goal of this project (TR-633) is to improve the longevity and performance of the highway infrastructure made with HPC in Iowa through reducing the concrete shrinkage and cracking potential. The specific objectives of the present Phase II study are:

(1) To investigate different methods and identify the most functional, practical and effective method
for controlling the shrinkage cracking applicable for Iowa HPC mixes.
(2) To investigate field performance of the Iowa HPC mixes and compare concrete mixes with different shrinkage cracking potentials (high and medium) and concrete mixes with and without shrinkage control methods.
(3) To compare the test results and observations obtained from the lab and field investigations and
provide rational recommendations for the Iowa concrete industry to effectively control shrinkage of HPC.

DISCUSSION

Q. On the monitoring you mentioned shrinkage strain being measured is that fairly typical in terms of strain in the material in a field application?
A. We try to get the shrinkage strain related to the behavior of the concrete.

Motion to Approve by K. Jones; 2nd L. Roehl
Motion carried with 12 Aye, 0 Nay, 0 Abstaining.

5. **PROPOSAL, *"Cost-Competitive Tiber Bridge Designs for Long Term Performance",*** Travis Hosteng, Iowa State University on Behalf of Brian Bradshaw, University of Minnesota Duluth, ($212,883) This project is being fully funded by the MN Local Road Research Board. The request is for the IHRB to cost-share and be a part in this research project.

BACKGROUND

MnDOT data shows that only 17 timber beam or slab bridges have been constructed in Minnesota since 2000. During the same period, over 475 concrete slab spans or prestressed concrete beams bridges have been constructed. This has occurred due to a number of factors, including misconceptions about the durability, structural adequacy and expense of constructing timber bridges. However, significant advancements in design, preservation, maintenance and inspection of modern timber bridges have been made. Recent national service life assessment research has shown that timber is a durable option for primary structural members in highway bridges and can perform satisfactorily for over 50 years when properly designed, fabricated and maintained. However, both anecdotal assumptions and cost reports have indicated that timber bridges are more expensive than concrete bridges to construct (MnDOT 2013).

OBJECTIVES

The objective of this project will be to develop a series of design, contracting and construction options and strategies for cost-competitive (initial and life cycle costs), sustainable timber bridges in Minnesota that meet AASHTO HL-93 load requirements and LRFD bridge design specifications. The project will incorporate standard plans for timber bridge superstructures that are currently under development by the USDA Forest Service. These plans will be evaluated and modified for Minnesota and when coupled with best inspection and maintenance procedures, provide new opportunities for constructing innovative, long-lasting and cost-competitive timber bridges. Finally, several bridge construction projects would be identified with partner counties that would use the developed plans, allowing the project team to assess and validate the true initial costs of construction, predict life cycle costs and complete a life cycle assessment for these bridges.

DISCUSSION

Q. What is the possibility of the County using this standard as it develops?
A. There is high opportunity, there are a number of bridges that get recycled every year and it is a cost effective material.
Q. Are they going to collect data on bridges in Minnesota?
A. They are going to look for any timber bridges built recently that have cost information.
Q. Can data from bridges in Iowa be included?
A. Yes, there are several timber projects done in Iowa that can be incorporated.
Q. What are the spans that can be done with timber bridges?
A. 70 feet can easily be achieved, depending on hydrology needs and depth of superstructure. There are bridges in the south that span over 100 feet.

Motion to cost share $106,442 in collaboration with MN DOT by W. Weiss; 2nd K. Mayberry
Motion carried with 11 Aye, 1 Nay, 0 Abstaining.

6. **Interim Report TR-676 Phase I, *"Impacts of Internal Curing on concrete Properties",*** Pete Taylor, Iowa State University/InTrans

BACKGROUND

Lightweight fine aggregate is finding increasing application in the construction of bridge decks because of the improvement in strength development and potential durability while reducing cracking risk. This improvement is achieved by the small lightweight particles uniformly providing water to the mixture as hydration proceeds. This

internal curing (IC) reduces the risk of internal desiccation in low w/cm mixtures, and helps to level out variation in moisture content through the thickness of the slab. Their use in pavements is less common, one trial section built in Texas and one about to be built in Kansas.
In some mixtures, particularly those with very low w/cm (below 0.40) there is a real risk of internal desiccation because insufficient water is available to hydrate all of the cement in the mixture. This can lead to autogenous shrinkage, and in the extreme, a loss of performance over time.
Most curing activities are applied to the surface of the concrete, and their effect is largely limited to a small zone near the surface. Therefore, surface curing, while essential for surface durability, will not likely provide a significant benefit more than about an inch below the surface. Internal curing, however, will be effective through the depth of the pavement and so reduce differential moisture contents that cause warping.
Internal curing is the practice of providing reservoirs of water within the mixture that are not part of the initial mixing water. The water is, however, released later to maintain sufficiently high RH in the pore system for hydration to proceed. Practice in the USA is to use lightweight fine aggregate (Figure 1) that is saturated before mixing. Fine aggregate is preferred to coarse aggregate because the particles are finely distributed through the mixture, thus maximizing the benefit through the whole volume.

OBJECTIVES

The objective of the proposed work is to perform laboratory and field testing and evaluate a concrete pavement constructed with and without IC concrete in an overlay section. The CP Tech Center will conduct material tests on the concrete mixtures used in the pavement during construction. Sensors will be embedded in the pavement to monitor temperature and moisture profiles. These sensors will be examined periodically over one year to observe seasonal affects. In addition, surveys will be conducted quarterly to observe and record the amount of warping cracking as a function of daily and seasonal environmental changes.
A County road that is being overlaid in 2014 will be used for analysis. Details of the overlay design will be at the behest of the County, who will also be responsible for the cost of construction. Work discussed in this proposal will be to provide assistance as needed to prepare mixture proportions, test the mixtures in the lab and the field, and to monitor the pavement for one year.
It is likely that the lightweight material can be obtained at no additional cost to the owner.

DISCUSSION

Q. Is the project selected for this research an overlay?
A. Yes
Q. Is this project already been let or is it going to be let?
A. Yes, this project has been let. It will be north of Ankeny South of Huxley.
Q. What about the initial strength of the concrete to get traffic back on?
A. This should not make a different.
Motion to Approve by D. Sprengler; 2nd L. Roehl
Motion to Approve the Interim report by K. Jones; 2nd Ahmad Abu-Hawash
Motion carried with 11 Aye, 0 Nay, 1 Abstaining.

7. **FINAL REPORT TR-653,** *"Assessment of Non-Destructive Testing Technologies for "Quality Control/Quality Assurance of Asphalt Mixtures",* Jeramy Ashlock, Iowa State University, ($82,707)

BACKGROUND

The American Association of State Highway and Transportation Officials (AASHTO) Mechanistic-Empirical Pavement Design Guide (MEPDG) was developed to enable quantitative performance prediction for the design of new and rehabilitated pavement structures.

In addition to traffic and climate data, the mechanistic-empirical (M-E) design procedure requires measurement of fundamental pavement material properties rather than use of empirical relationships.

Therefore, quality control and quality assurance (QC/QA) procedures based on measured fundamental properties are necessary to enable quantitative evaluations of pavement condition and performance.

Significant time and financial resources are currently spent on QC/QA testing of asphalt pavement construction projects. Substantial research efforts have focused on several non-destructive testing (NDT) technologies for flexible pavements, with the goals of improving the speed and accuracy of QC/QA methods and enabling the state of practice to evolve beyond destructive testing.

Some examples of these NDT technologies are nuclear gauges, electromagnetic gauges, permeability-based approaches, seismic testing techniques, and intelligent compaction. However, the destructive and relatively time-consuming coring process for laboratory measurement of density continues to be the most widely used QC/QA method in the US.

The process of coring slows construction progress, while placement of inadequate pavement before test results are obtained can cause project delays and financial penalties. In addition, the destructive coring process creates holes in the new pavement that are sometimes improperly repaired, leaving it more susceptible to premature failure.

OBJECTIVES

The objectives of this project were to assess the performance of several in situ NDT technologies for QC/QA of asphalt mixtures and to perform a preliminary study of micro-electromechanical systems (MEMS)-based sensors for QC/QA and health monitoring of asphalt pavements.

IMPLEMENTATION

In the future have a discussion on another phase to go out and verify our FWD to help us in our back calculation of FWD with the composit systems.

*****1 member joined the table. Total voting members = 13**
Motion to Approve the final report by; S. Okerlund 2nd Ahmad Abu-Hawash
Motion carried with 13 Aye, 0 Nay, 0 Abstaining.

8. **FINAL REPORT TR-658,** *"Development of Quality Standards For Inclusion of High Recycled asphalt Pavement Content in Asphalt Mixtures – Phase II"*, David Lee, The University of Iowa, ($150,000)

BACKGROUND

Agencies have been successful in utilizing high contents of fractionated RAP (FRAP) with a PG binder that is softer in comparison with the original PG binder grade. It is critical to evaluate the use of high FRAP content mixes in the field test section that could reduce the cost of HMA mixtures, yet maintaining performance expectations of standard mixes. Experiences gained from the field implementation of high-FRAP mixtures on Iowa's state highway can help contractors use the higher percentages of RAP materials up to 40% by weight.

OBJECTIVES

The objective of this research is to 1) build a test section utilizing HMA mix designs with up to 40% RAP materials, 2) evaluate the moisture sensitivity of High-RAP mixtures, 3) characterize the low-temperature fracture behavior of High-RAP mixtures, and 4) monitor the condition of the field test section in one year after the construction.

Motion to approve the final report by; K. Jones 2nd Ahmad Abu-Hawash
Motion carried with 13 Aye, 0 Nay, 0 Abstaining.

9. NEW BUSINESS

We did not get enough interest in County Engineers attending the Low Volume Road Conference to pay for registration.

Vanessa asked for a request to cover the travel for Mark Nahra. He is a speaker and one of the Planners for Low Volume Road Conference. TRB is covering the registration, hotel and per diem allowance.

Motion to Approve the Reimbursement of Travel by; W. Weiss 2nd P. Mouw
Motion carried with 13 Aye, 0 Nay, 0 Abstaining.

The Ultra High Performance Concrete Training for Locals was one of the topics that we are planning to fund in fiscal year 16 program. Ahmad is scheduling a UHPC workshop so using this opportunity to fund an additional day at the workshop with an agenda to help develop training for local agencies that we would invite. Funding amount $50,000, this includes cost for the workshop as well as other training materials that may be needed to be developed.

Motion to approve funding for workshop by; K. Jones 2nd L. Roehl
Motion carried with 13 Aye, 0 Nay, 0 Abstaining.

Vanessa is officially the Secretary to the IHRB Research Board and will be hiring a Secondary Road Research Engineer.

10. ADJOURN

The next meeting of the Iowa Highway Research Board will be held Friday, April 24, 2015, in the East/West Materials Conference Room at the Iowa DOT. The meeting will begin promptly at 9 a.m.

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Vanessa Goetz, IHRB Secretary